Management of Small Docks and Piers

Best Management Practices

Forward—

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Introduction—

Small private docks in coastal areas occupy public waters and extend across lands where the public has certain rights of access and usage. In most jurisdictions, docks and similar structures are not a right but a privilege. As such, it is reasonable to use police powers or rights of ownership to establish strict standards to protect environmental health, navigation and access, or visual and community character.

The "Avoid—Minimize—Mitigate" system is a common method to manage impacts of any type.

Where possible, projects should be designed or regulated to avoid impacts to publicly held values. Failing this, any adverse impacts should be minimized, preferably to a *de minimus* level. Where impacts will be above a minimal level, and the public benefits outweigh the detriments, the adverse impacts may be mitigated. Mitigation involves some sort of "payment" to cover the "public costs" of the impacts. This may include establishment of a new submerged aquatic vegetation bed or shellfish area to replace one that would be destroyed by construction of the dock, establishment of an upland pathway around the landward end of a dock to allow public passage along the shore, payment of a leasing or licensing fee for occupation of public lands and waters, or creation of a public access way from the uplands to the water's edge. It should be noted that mitigation is an inexact process to date—not all mitigation actions are successful and resource loss may not be prevented.

Best Management Practices Related to Vegetation

Management Practices Related to Shading

As with many aspects of small dock management, it is difficult to generalize about Best Management Practices (BMPs) to avoid or minimize impacts from shading. In the Environmental Impacts Chapter it was noted that different species of marsh or submerged aquatic plants need different amounts of light to achieve maximum growth or to simply maintain their existence. To date, exact light requirements have not been determined for all plant species found in marshes or shallow waters. Latitude may have an effect due to differences in the sun's inclination and length of the growing season. Water clarity may also affect the amount of light reaching submerged vegetation.

As was noted in the Environmental Impacts Chapter, marine SAV and marsh plants require between 12–25 percent of ambient light levels to survive, depending on the species, and approximately 50 percent or higher for full growth (Kearney *et al.,* 1983; Kenworthy and Haunert, 1991; Shaefer and Robinson, 2001; Burdick and Short, 1999). No computer program or other system presently exists that would allow coastal managers to predict shading impacts from a proposed dock design or siting.

However, a number of techniques have been proposed to attempt to approach or meet these light requirements.

- Elevate docks.

  A typical recommendation is one foot of elevation above mean high water for each foot of dock width for docks over tidelands (New England District, U.S. Army Corps of Engineers, 1996) or a minimum of five feet above mean high water (Shafer and Lundin, 1999). Similar figures for elevation above the marsh face have been adopted in several states. Burdick and Short (1999) suggest that dock elevation should be greater than 3 meters (9.9 feet) above the substrate in areas with tidal ranges less than one meter (3.3 feet). See NOAA's Dock Database of State Programs (design criteria section) for examples of height standards for various states. <http://coastalmanagement.noaa.gov/dock.html#5>)

- Keep docks as narrow as possible.

  Walkways and ramps leading to the dock terminal or float should be kept as narrow as possible. For a residential dock, this is typically a maximum width of three to four feet to allow for foot traffic or passage of a dock cart (Shafer and Lundin, 1999). If only foot traffic is expected, the walkway may be even narrower. Communal docks must comply with the Americans with Disabilities Act (ADA. The Act generally calls for a five-foot width, allowing for narrower openings when passing between pilings.

- Orient the dock and/or terminal platform as close as possible to North-South.

  Burdick and Short (1998, 1999) found this to be a significant factor in their investigations in Massachusetts. Sanger and Holland (2002) report that orientation was not a significant factor in shading in their South Carolina study. Shaefer and Lundin (1999), based on their work in Florida, recommend that portions of a dock passing over seagrass should "be oriented north-south to the maximum extent that is practicable."

- Avoid covering docks or piers with structures.

  Roofed or walled structures on the dock or pier often completely eliminate all light transmission to the area below the dock and, due to their height, also expand the shadow impacts from the structure.

Oversized hand railings may also increase shadow effects.

- <u>Increase light transmission through the structure.</u>

  There are several techniques that can be used to increase light transmission through the dock, although limited research is available on the effectiveness of each approach.

  Plank Spacing: Regulations or guidance for dock design often call for a specific spacing between deck boards; often between 1/2 inches and an inch. It is unclear what, if any benefit this may have in increasing light transmission, particularly in northern latitudes (Ludwig in Kelty and Bliven, 2003).

  Alternative Decking Materials: Shafer and Lundin (1999) tested the use of fiberglass grating on docks in St. Andrew Bay, Florida that extended over a seagrass bed of *Thalassia testudinum.* The grating material used was 1-inch thick reinforced fiberglass with 2 inch by 1inch openings. On a dock five feet above mean sea level, the light levels never dropped below saturation. On a 4-foot high dock light levels below the dock dropped below saturation only briefly during the day. In each case the fiberglass grating performed far better than solid wood plank decking. Fiberglass grating costs approximately 20 percent more than wood planking but tends to last longer, thereby minimizing the cost differential. There has been limited testing of this type of grating in northern latitudes and so it is not clear how successful it would be in New England or the Pacific Northwest. A small number of studies by Ludwig (in Kelty and Bliven 2003) in New England using a product called Morton Open-Grip Grating and found little difference in light reduction as compared to solid planking. Several companies offer other types of grated decking, suggesting its ability to pass light as an environmental benefit. Most, however, have not been tested to quantify their light transmission capabilities.

  The St. Johns River (FL) Water Management District began testing the use of translucent decking material in the Fall of 2003. They decked a series of docks with fiberglass panels produced by PROMSA® Fiberglass Marine Products located in El Salvador. Laboratory tests indicated that the translucent panels allow about 56 percent of ambient light to pass through. After a year, however, the panels had weathered and the light transmission had been cut in half. The hurricanes of 2004 disrupted the experiment and it will be reinitiated in the future (Dobberfuhl, 2005. Pers. com.).

  Glass Prisms: Steinmetz *et al.* (2004) evaluated light transmission on docks constructed with embedded hexagonal glass prisms, similar to those used to provide light below-decks in wooden sailing vessels. Light penetration, water quality and SAV cover were measured in the St. Johns River, Florida under experimental docks with prisms, without prisms, and in control areas without docks. The results showed that only about 3–4 percent of ambient light passed through the deck—well below the minimal needs of the vegetation. Results showed no difference in SAV growth between docks fitted with the prisms and those with board decking.

- <u>*Limit the length of the dock to the minimum needed to reach water navigable at mean low water*.</u>

Dock length can involve a complicated trade-off; a longer dock to reach navigable waters may have greater impacts on sea grasses, while a shorter dock may lead to adverse impacts to sea grasses from boating impacts. Such situations are best resolved on a case-by-case basis.

Management Practices Related to Construction Impacts

- Keep construction equipment off the marsh face to the maximum extent possible.

  Improper construction methods can damage existing vegetation or change marsh elevations by compacting the peat bed. The most effective means to minimize such impacts is to keep equipment off the marsh face and inter-tidal mudflats. Construction can be done by working out along a walkway or from a floating platform at high tide. If equipment must go onto the marsh face or through the intertidal zone, it should be specially designed to exert low ground pressure. Machines are currently available that exert less than two pounds per square inch to the marsh face—a level that will minimize compaction.

- Install pilings with techniques that minimize impacts to submerged vegetation and bottom sediment topography.

  Installation of pilings can destroy submerged vegetation and change the topography of bottom sediments. Driven piles have the least impact. If jetting must be used in instances where driving piles is infeasible, low-pressure jetting techniques cause less disruption than high-pressure methods. Sharpening pile tips aids in insertion and helps avoid adverse impacts (Shaeffer and Lundin, 1999).

  In instances on rocky shores where pilings are not feasible and some type of support structure is needed, the supporting structure should have as small a footprint as possible, based on sound engineering, to minimize impacts to the benthic habitat.

Management Practices Related to Storage of Floats or Boats on the Marsh

- Avoid storing floats on the marsh face or tidal flats.

  Floats stored for the off-season on the marsh face or tidal flats will damage vegetation, disrupt wildlife habitat, and have the potential to compact the peat bed of the marsh, leading to ponding or erosion. Floats should be removed to upland areas, either by carefully moving them across the marsh or by floating them to a landing area where there will be no impacts to the marsh or shallows.

- Avoid long-term boat storage on the marsh face.

  Boats stored directly on the marsh will shade vegetation in the same manner as a dock. This sort of storage can also focus foot traffic creating more extensive damage to vegetation as people go back and forth to the boat. Wherever possible, small boats should be stored on a float, left in the water, or removed to upland areas.

Best Management Practices Related to Contaminants

Leachates from Wood Preservatives

- <u>Avoid the use of oil-based preservatives such as creosote or pentachlorophenols.</u>

  Use of these treatments for residential docks is illegal in most states.

- <u>Avoid the use of Chromated-Copper-Arsenate (CCA) treated materials in fresh water.</u>

  The wood preservation industry no longer manufactures CCA-treated materials for use in freshwater situations and their use is not acceptable. Other treatments such as ACQ or CA/Wolmanized® are appropriate for freshwater use.

- <u>Carefully consider the use of CCA-treated materials in marine waters.</u>

  Avoid or limit the use of CCA-treated materials in areas of low flushing. Other options include;

  - Putting a sleeve over the piling to prevent leaching,
  - Substituting other materials for wood surfaces frequently or continuously exposed to water. These could include recycled plastic or composite decking or plastic, metal, or concrete pilings,
  - Replacing treated wood with untreated wood. Some hardwoods (*e.g.,* black walnut, white cedar or chestnut) are naturally resistant to decay and can withstand significant water exposure (Daly 1994).

  There are increased costs with all of these options, but they may be offset by longer life expectancy.

  Where CCA-treated materials are to be used, soaking it in saline waters for 90 days prior to installation will allow leaching to occur in a controlled setting (Sanger in Kelty and Bliven, 2003). The soaking waters should be disposed of in a manner to avoid environmental exposure.

  Decking material and other structural elements that are not subject to regular immersion need not be constructed of treated materials. Untreated wood, plastics, or fiberglass decking are options.

Impacts from Flotation Materials

- <u>Use flotation materials that are not subject to damage and will not adversely impact the environment.</u>

  Open-cell expanded polystyrene (EPS) ("beadboard" or Styrofoam™) and metal or plastic industrial drums have been used as floatation materials for floating docks and platforms. However, these products, as described in the Environmental Impacts Chapter, can have deleterious impacts.

  When EPS is used as a floatation material, it is subject to breakage. This not only lessens the floatation capability of the structure but also releases small pellets of polystyrene into the environment.

Industrial drums of either metal or plastic are not designed for extended exposure to water. The can rupture with a resulting loss of flotation and the potential for release of any residue remaining in the barrels from their original use.

Safer flotation materials include closed cell EPS materials (which should be enclosed for protection from abrasion or damage from rodents in wood, wire mesh, or plastic casings) or dedicated plastic float drums (Burns, 1999)

Impacts from Painting and Seasonal Upkeep

- <u>Avoid the use of paints, stains, solvents, or soaps when maintaining walkways and floats when they are over water or marshland.</u>

  Painting, staining or use of solvents or soaps for cleaning of decking should be avoided to minimize spills into waters or onto the marsh face. Painting or staining do not appear to add any life expectancy to the materials and cleaning with sea or lake water is as effective as the use of soaps or solvents (Maine State Planning Office, 1997).

Impacts from Fuel Leakage

- <u>Avoid storing or pumping fuel on small private docks.</u>

  Fuel pumps or storage of fuels on docks can lead to spills. While fuel availability on a dock may be necessary for a marina, yacht club, or commercial wharf, it is seldom appropriate for residential docks. In almost all cases, fuel can be carried onto the dock and poured by hand.

- <u>Promote the use of fuel socks/collars when fueling boats at a dock.</u>

  Petroleum absorbent socks or collars should be stored on docks and available for use anywhere fueling takes place.

- <u>Provide educational materials to dock owners explaining the damage that can be caused by fuel spills.</u>

  Fuel spills can cause damage to the environment as well as degrading dock flotation materials. The dock owners and users should learn safe fueling techniques to avoid spillage. Small outboard motors can be removed to upland areas for refueling.

Management Practices Related to Associated Boating Uses—
Impacts from boating uses are difficult to manage—typically there is little or no means to enforce regulatory standards. Voluntary compliance by boaters and dock owners is typically the only way to reduce impacts.

- <u>Establish speed limits or “no wake” zones around docks.</u>

- Provide educational materials to dock owners and boaters explaining the potential impacts from inappropriate boating activities.

Management Practices Related to Sediments and Sedimentation—

Impacts from Altering of Water Flow

- Space pilings so that they do not present a barrier to water flow.

  The Massachusetts Department of Environmental Protection (Undated, ca. 1979) recommends that pilings or other dock elements entering the water be no closer together than ten feet. Shaefer and Lundin (1999) also recommend a minimum ten-foot spacing between pilings for Florida waters. Avoid use of solid fill piers or groins for small private docks.

Impacts from Pile Installation

- Use appropriate pile installation techniques to minimize disturbance of sediments.

  Impacts from installation of pilings can be minimized through the use of drop hammers or other means of driving the piles. Use of jetting should be limited to low-pressure jets where feasible (Shaefer and Robinson, 2001; Shaefer in Kelty and Bliven, 2003).

Impacts from boats and floats resting on the bottom

- Prevent floats or boats from resting on the bottom at low tide.

  There has been very little quantitative research on this topic, however anecdotal evidence suggests that floats or boats allowed to rest on bottoms with soft sediments can compact those sediments and/or lift them into suspension when the float or boat lifts with the tide (Ludwig, 2000, pers. com.). The latter "pumping" effect can change sediment composition and thereby habitat. Floats may be kept off the bottom by having stops or chains on pilings to prevent its resting on the bottom as the tide goes out. Another option is to add feet or runners to the underside of floats thereby reducing the surface area that sits on the bottom.

  Boats should be stored on the floats or moored in waters deep enough to avoid their resting on the bottom at low tides.

Management Practices Related to Navigation and Riparian Access—

Generally docks are private structures that extend across intertidal areas and into public waters—both areas where the public has certain rights. As such they should be constructed to minimize or mitigate adverse impacts to public usage. In almost all jurisdictions, there is no legal riparian right to a dock of any size. Rather, the community or state has the right to limit the dock size—or prohibit it entirely—to protect environmental, visual, navigation or access impacts.

General BMPs Related to Navigation and Access

- Limit docks and their designs to strictly water-dependent uses.

  This includes access to waters of suitable depth but does not necessarily include gazebos or other structures at the end of docks, fuel stations, electrical systems, etc.

- Charge reasonable fees for the occupation of public waters and issue licenses that allow for periodic review.

  Private use of public waters and inter-tidal lands should come at a reasonable cost. Licenses or leases for such use should allow for periodic review to ensure that changes in public values related to the waterway may be reflected. While riparian access runs with the ownership of waterfront property, the ownership and maintenance of a dock or similar structure should be re-evaluated from time to time.

Management to Protect Navigation

- Preclude extension of docks into channels, federal navigation projects, mooring fields and other areas where public boating takes place on a regular basis.

- Avoid construction of docks that would adversely affect navigation through a waterway, either through physical or visual barriers.

  The ability to safely navigate through a waterway requires not only that a vessel have sufficient room to maneuver but also have clear sightlines to avoid collisions with other vessels, fishermen/shellfishermen, swimmers, or others using the waterway. The construction of docks should not block passage or impede visibility to operate safely.

  Paddle craft have their own special needs in navigation. Generally these vessels stay out of the main channel in shallower water away from larger vessels and their wakes. Dock construction should recognize traditional paddling areas and dock length should either be short enough to provide safe passage around the end of the docks or space should be provided between pilings and under decking for such craft to safely travel “through” the structure.

- Prohibit extension into narrow or constricted waterways that would impede navigation.

  Typically dock length should not exceed 20–25 percent of the width of the waterway. The actual percentage may vary depending on specific site conditions.

- Maintain a setback between docks.

  A 50-foot distance between docks will allow for maneuvering of boats with a length of 30–32 feet. Greater spacing may be needed for boats of a longer length or that require greater turning radii.

- Establish suitable setbacks from communal boat docks or launch areas.

  Typical setbacks are 50–100 feet, depending on the characteristics of the site and the size of boats using the facilities or adjacent docks.

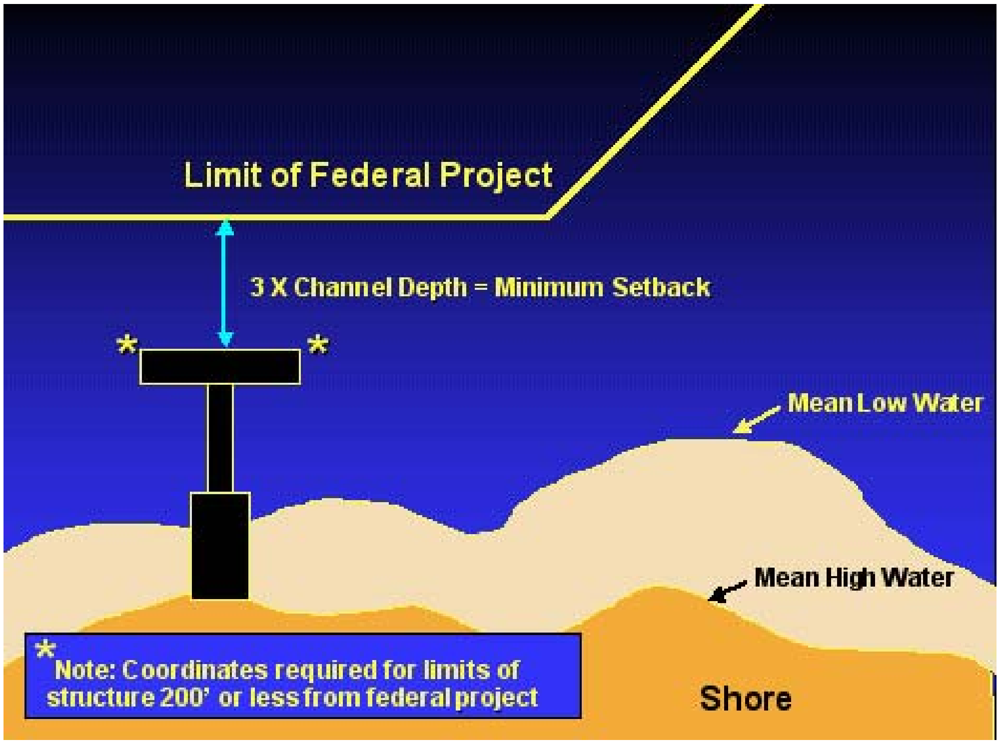

Figure 1. This graphic shows typical setbacks from federal navigation projects, mooring fields, or anchorages.

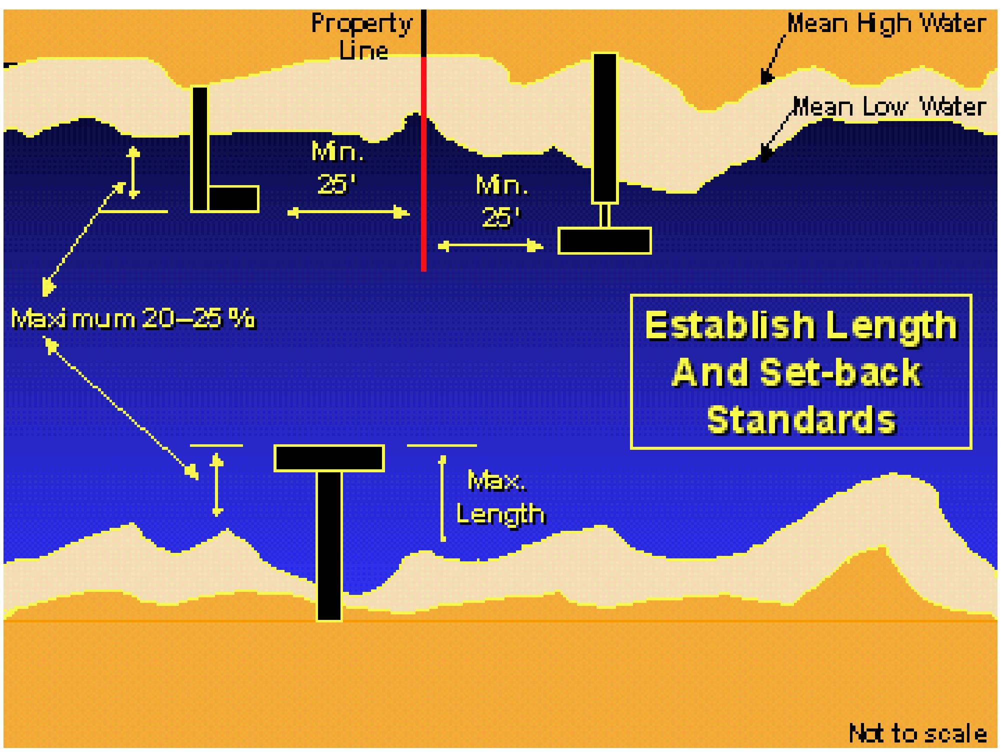

Figure 2. This graphic illustrates typical limits for dock length in linear waterways and setbacks from property lines to avoid interference in landing vessels.

Management to Protect Public Access

- Design and construct private docks to allow foot passage along the shoreline in areas protected by public trust doctrine rights.

  The areas subject to public trust rights and the nature of those rights vary from state to state. Except in unusual situations, all waters below the mean low tide line are public. Public rights in intertidal areas and those above the high tide line vary by state and, therefore, mitigation should be shaped by state laws. Techniques to aid passage include a dock sufficiently elevated to allow comfortable foot traffic beneath the structure, a stairway over the dock, or establishment of an upland pathway around the landward end of the dock.

- Establish setbacks from areas of the water or shoreline used for public activities.

  Such activities may include public beaches, shellfishing areas, boat launch facilities, etc. Typical setbacks range from 50–100 feet depending on the nature of the activity, site characteristics, and size of boats using the waterways.

- Set speed limits and/or no-wake zones for boats in the area of public access points or facilities.

- Mitigate impacts to longshore public access rights by negotiating perpendicular access that allows passage from public uplands to the shoreline.

Management Practices Related to Visual Access Issues—

- Establish standards for visual impact or community character that apply to dock design and construction.

  These may be applied state- or community-wide or in specific areas. The latter may include political jurisdictions, geographic or geologic areas, bodies of water, or areas of public use. Standards may regulate a wide range of dock characteristics including height, length, color, construction materials or types of lighting—or may prohibit structures altogether.

- Implement standards for visual impact or community character through a regulatory permitting (case-by-case) or a zoning-type system (e.g., zoning overlay district, harbor management plan, subdivision control ordinance) that allow for broader management implementation.

  There is a range of standards available to manage visual impacts. Which techniques are selected depends on the existing setting, its "visual character," future plans for the area, and the values of the decision-making body. The generic preferences for coastal structures identified by Smardon (in Kelty and Bliven, 2003) can form a basis on which to overlay state or local standards. Thus, the following mitigation measures should be considered in establishing standards to limit visual impacts:

  1. Reducing the length, height and overall size of the dock or associated structures,

2. Maintaining a minimum distance between structures (this might involve requiring communal or shared docks rather than a one-dock-per-lot situation),
3. Encouraging the use of “natural” or “traditional” materials and designs typically found in the surrounding landscape setting,
4. Reducing the contrast in color or shadow between the proposed structure and the surrounding landscape,
5. Establishing setbacks for shoreline structures to minimize “visual clutter.”

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